Fire regime alteration in Research Natural Areas can significantly impact the ecological values that they were set aside to protect.

How far departed are your forest's Research Natural Areas?

Research Natural Areas (RNAs) are part of a national network of federal lands set aside for research, baseline monitoring, education, and biodiversity protection. Protected from direct manipulation, RNAs offer some of our best examples of minimally disturbed ecosystems on Forest Service lands. However, these natural areas are also embedded within a matrix of federal lands, where landscape-scale fire regime alternation has resulted in significant changes to the frequency and severity of wildfires.

New research from the Region 5 ecology group suggest that some of our RNAs may require intervention to restore and maintain natural fire regimes. The purpose of this brief is to provide a summary of fire regime departure within the RNAs on your forest and to present general management strategies to consider when addressing fire regime restoration in these protected areas.

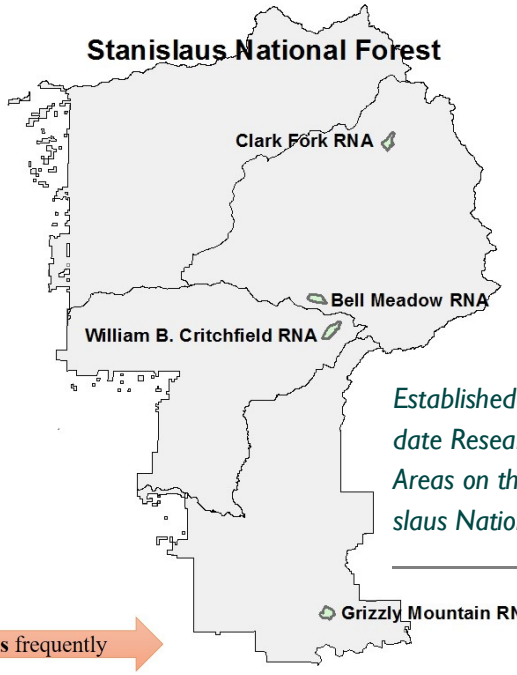
Stanislaus National Forest RNAs

Clark Fork RNA: 617 acres, Candidate for Establishment for White Fir Target elements

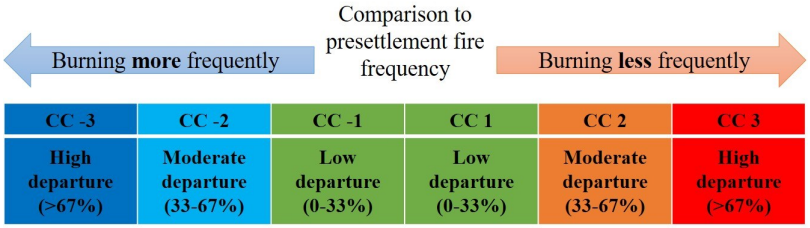
Bell Meadow RNA: 640 acres, Established in 1994 for Aspen and Montane Meadows target elements

William B. Critchfield RNA: 842 acres, Established in 1994 for Red Fir and Montane Meadows target elelments

Grizzly Mountain RNA: 680 acres, Established in 1994 for California Black Oak target elements



Established and Candidate Research Natural Areas on the Stanislaus National Forest



How is departure quantified? The fire return interval departure (FRID) dataset was developed by the USDA Forest Service to assess the similarity between modern and presettlement (i.e., pre-1850) fire frequencies. FRID values range from -100 to 100, with positive values indicating that vegetation is currently burning less frequently than it would have under the presettlement fire regime, and negative values denoting that it is burning more frequently. FRID values are further categorized by low, moderate, and high departure condition classes (see figure above).

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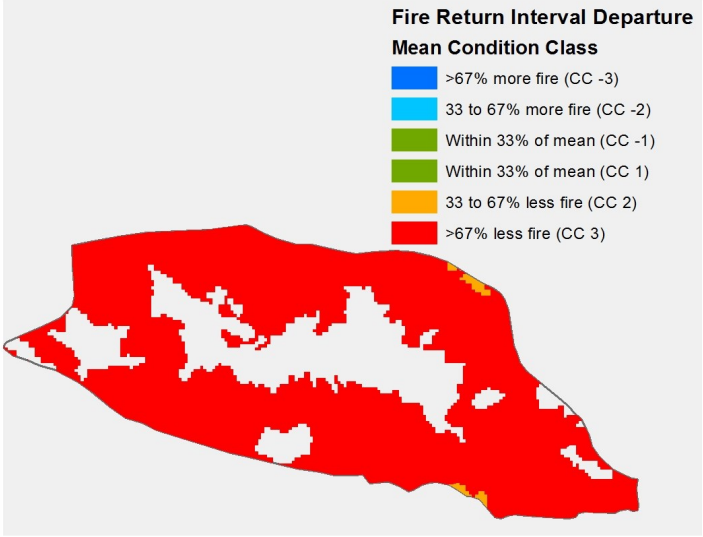
Fire Return Interval Departure Summary: Bell Meadow RNA

- The mean percent fire return interval departure for the Bell Mountain RNA is 83%.
- This means that vegetation types within the RNA are burning **less** frequently than they would have historically and have current fire return intervals (FRIs) that are **6** times longer than expected under presettlement conditions.
    - Current mean fire return interval: 102 years
    - Estimated mean presettlement fire return interval: 17 years
- 99% of the RNA is highly departed in terms of fire frequency (i.e. CC 3 - the modern fire return interval is more than three times longer than the presettlement FRI) and 1% is moderately departed (i.e. CC 2 - the modern fire return interval is 1.5-3 times longer than the presettlement FRI).



Fire return interval departure in the Bell Meadow RNA.

- The last recorded fire occurred in 2003 during the Mountain Fire and burned a small area (46 acres, 10% of the RNA) in the southeast corner of the RNA. The fire burned at low to moderate severity within the RNA. The remainder of the RNA (437 acres, 90%) has not burned in over 100 years.
- About 25% of the RNA is dominated by herbaceous vegetation (meadows, fens, etc.) where FRID data are not available.
- Within the dominant vegetation types in the RNA, the most departed is Yellow Pine (FRID: 89%) followed by Sierra mixed conifer (FRID: 83%).

Management take home: Vegetation within the Bell Meadow RNA is highly departed from the presettlement fire regime in terms of fire frequency. The target elements are burning less frequently than they would under historic conditions. While there is no data available for the meadow target element, departure of vegetation surrounding the meadows could negatively impact the meadow vegetation. Ensuring the long-term sustainability of this RNA will require the reintroduction of fire (e.g. managed wildfire or prescribed fire) to reduce fuel loading, maintain the Aspen and Montane meadow target elements, and increase the likelihood that future wildfires burn at intensities consistent with the natural fire regime.

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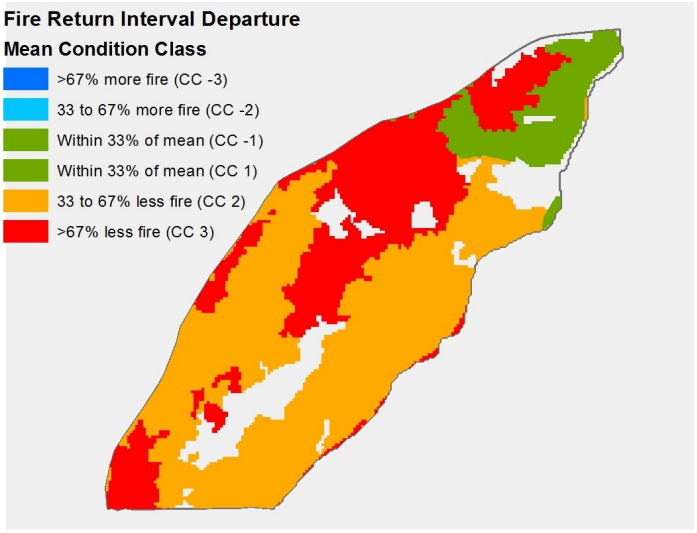
Fire Return Interval Departure Summary: William B. Critchfield RNA

- The mean percent fire return interval departure for the William B. Critchfield RNA is 65%.
- This means that vegetation types within the RNA are burning **less** frequently than they would have historically and have current fire return intervals (FRIs) that are **3** times longer than expected under presettlement conditions.
    - Current mean fire return interval: 95 years
    - Estimated mean presettlement fire return interval: 30 years
- 32% of the RNA is highly departed in terms of fire frequency (i.e. CC 3 - the modern fire return interval is more than three times longer than the presettlement FRI), 57% is moderately departed (i.e. CC 2 - the modern fire return interval is 1.5-3 times longer than the presettlement FRI) and 11% of the RNA is not departed (i.e. CC 1 - the modern and presettlement FRI are similar).



Fire return interval departure in the William B. Critchfield RNA.

- The last recorded fire occurred in 2003 during the Box and Mountain Fires and burned a small area (132 acres, 18% of the RNA) in the northeast corner of the RNA overlapping the area that is not currently departed. The fires burned primarily at low to moderate severity within the RNA. The remainder of the RNA (608 acres, 82%) has not burned in over 100 years.
- About 12% of the RNA is dominated by herbaceous vegetation (meadows, fens, etc.) where FRID data are not available.

Management take home: Vegetation within the William B. Critchfield RNA is moderately departed from the presettlement fire regime in terms of fire frequency. The target elements are burning less frequently than they would under historic conditions. While there is no data available for the meadow target element, departure of vegetation surrounding the meadows could negatively impact the meadow vegetation. Ensuring the long-term sustainability of this RNA will require the reintroduction of fire (e.g. managed wildfire or prescribed fire) to reduce fuel loading, maintain the red fir target element, and increase the likelihood that future wildfires burn at intensities consistent with the natural fire regime.

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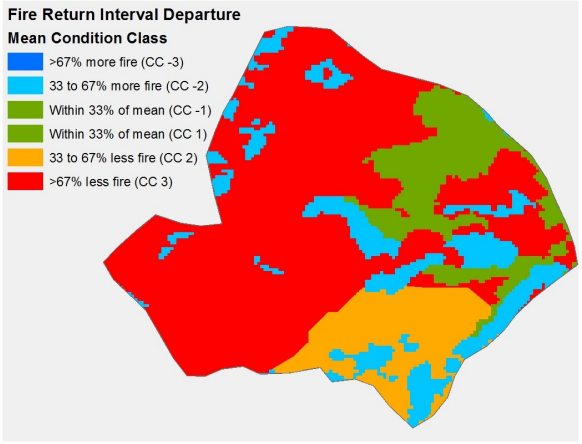
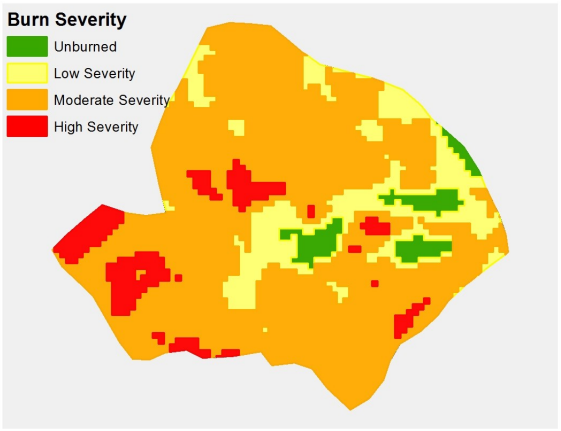
Fire Return Interval Departure Summary: Grizzly Mountain RNA

- The mean percent fire return interval departure for the Grizzly Mountin RNA is 41%.
- 73% of the vegetation types within the RNA are burning **less** frequently than they would have historically and have current fire return intervals (FRIs) that are **3** times longer than expected under presettlement conditions.
    - Current mean fire return interval: 34 years
    - Estimated mean presettlement fire return interval: 11 years
- 14% of the vegetation types within the RNA are burning **more** frequently than they would have historically and have current fire return intervals (FRIs) that are almost **2** times more frequent than expected under presettlement conditions.
    - Current mean fire return interval: 34 years
    - Estimated mean presettlement fire return interval: 55 years
- 61% of the RNA is highly departed in terms of fire frequency (i.e. CC 3 - the modern fire return interval is more than three times longer than the presettlement FRI), 26% is moderately departed (i.e. CC 2 and CC –2 - the modern fire return interval is 1.5-3 times longer (12%) or shorter (14%) than the presettlement FRI), and 14% of the RNA is not departed (i.e. CC 1 - the modern and presettlement FRI are similar).
- The last recorded fire occurred in 1987 during the Larson Fire which burned the entire RNA. The fire burned primarily moderate severity within the RNA.



Fire return interval departure in the Grizzly Mountain RNA..



Burn Severity from 1987 Larson Fire.

- Within the dominant vegetation types in the RNA, the most departed is Dry Mixed Conifer (FRID: 68%) followed by Yellow Pine (FRID: 40%) and within the Yellow Pine vegetation type, California Black Oak (67%).

Management take home: Vegetation within the Grizzly Mountain RNA is moderately departed from the presettlement fire regime in terms of fire frequency. Ensuring the long-term sustainability of this RNA will require the reintroduction of fire (e.g. managed wildfire or prescribed fire) in areas that are burning less frequently to reduce fuel loading, maintain the California Black Oak target element, and increase the likelihood that future wildfires burn at intensities consistent with the natural fire regime. However, 14% of the RNA is burning too frequently therefore management actions should avoid reintroduction of fire in there areas.

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Management Considerations for RNAs

Encourage research and monitoring

The wide range of vegetation types and ecological conditions within protected natural areas, coupled with more restrictive management options, can make stewardship of these areas highly complex. Scientific research and monitoring can provide essential information to land managers, forming the foundation for science-based decisions and development of effective fire management strategies.

Develop wildfire management strategies

Wildfire management in natural areas requires scientific input and planning on a site-specific basis, so that fires can occur at an ecologically appropriate frequency, scale, and intensity. In areas where fire is likely to benefit ecological values, and suppression actions are not required to protect life, property, or significant resource values, management of wildfires for natural area objectives may be an appropriate course of action. In other areas, where ecological values may be threatened by too-frequent fire, suppression measures may be required to protect fire-sensitive ecosystems or habitats.

The long-term exclusion of fire from historically frequent-fire ecosystems, as well the increase in fire frequency in ecosystems adapted to long fire-free periods, puts many of the target elements within RNAs at risk of degradation or loss. In many cases, monitoring and proactive resource stewardship are essential to ensure that disturbance processes, such as fire, can proceed in an ecologically beneficial manner.

Consider proactive restoration to increase resilience to future disturbance

The small size of many research natural areas, their proximity to private lands where the risk of fire escape may be great, or a high degree of departure from the natural fire regime may prohibit the use of wildfire as a management tool in some areas. In these cases, prescribed fire or thinning of small trees might be implemented to reduce fuel loading and increase the likelihood that future wildfires burn at intensities consistent with the natural fire regime.

Link to documents or publications:

Coppoletta, M., H.D. Safford, B.L. Estes, M.D. Meyer, S.E. Gross, K.E. Merriam, R.J. Butz, and N.A. Molinari. 2019. Fire Regime Alteration in Natural Areas Underscores the Need to Restore a Key Ecological Process. Natural Areas Journal 39(2): 250-263. https://doi.org/10.3375/043.039.0211

This management brief overview was developed by Michelle Coppoletta, Sierra Cascade Province Associate Ecologist.

Safford, H.D., and K.M. Van de Water. 2014. Using Fire Return Interval Departure (FRID) analysis to map spatial and temporal changes in fire frequency on National Forest lands in California. Research Paper PSW RP-266. USDA Forest Service, Pacific Southwest Research Station, Albany, CA. https://www.fs.fed.us/psw/publications/documents/psw_rp266/psw_rp266.pdf

To apply for a Research Natural Area Use Permit visit: https://www.fs.fed.us/psw/rna/using.shtml

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